

**SUMMARY**

of the License Thesis entitled:

**TRAFFIC CONTROL SYSTEM IN THE
CONNECTED CARS CONTEXT**

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Abstract

Looking deeply in the domain of guided navigation we spotted that a large number of drivers have an inefficient approach when deciding their routes. The writer now proposes a bundle of questions to the impactful stakeholder of the mobility domain. Do you, as a Traffic Participant (driver of CO₂ emitting vehicle/ traffic jam generator), know how your behavior in traffic impact social environmental issues (climate change)? Did you know that this problem is part of an almost 1 trillion \$ problem stated by Insurance Journal? Do you want to assess your behavior and then change it? Would you, as a local Traffic Manager, prefer an analyzing and reporting tool to actually change your micro social Environment? Would you, as a Traffic Researcher, prefer an environment and a data generating community that would help you develop your bleeding edge technology that would mold the dynamics of the Connected Cars Context?

Problem Statement

Insurance Journal stated that 215 of the biggest companies anticipated that climate change could cost them up to 1 trillion \$ and creating an opportunity of 2 trillion for clean energy solutions (clean tech is included). One of the most targeted factors that goes into climate change, which impacts the outputs of these companies, is the CO₂ emissions (15% comes from traffic participants).

The hidden side of this problem is that, out of one's basic knowledge, future drivers' behavior is a mimic of the current status-quo. This goes back to the psychology of children which copy their parents/mentors.

Conclusively, the problem can be metaphorically compared to a Sequoia which has strong and deep roots, that cannot be cut in only a generation and has to take place as a change in current drivers' mentality.



Proposed solution

As a researcher that targeted in their study the aforementioned problem, one has identified that the main issue is analyzing and reporting this problem. In order to influence the root of the problem (empiric + intuition-based traffic navigators) the blueprint is to apply a bleeding edge technology (infrastructure + software) that would help influencing the current and the future traffic participants to change their bad habits.

Since the most challenges identified in achieving our objectives are Domain Challenges (view the Thesis), our silver bullet is to create a distributed system in order to centralize all the actions taken in the Connected Cars Context. Later on, this will generate a testing environment for passionate researchers (PoC, sanity testing environment).

As a follow-up one has proposed an abstract architectural design:

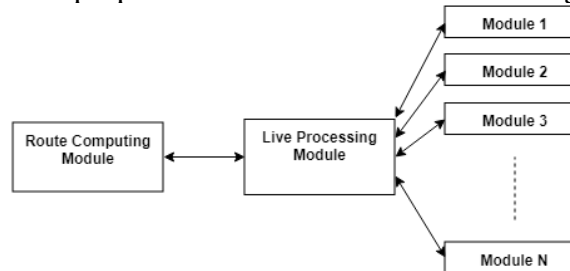


Figure 1. Conceptual Architecture of the TCS-3C

Route Computing Module is the component of the system that takes care exclusively of computing routes. It receives as input a route request and it returns the computed route based on the current status of the traffic.

Live Processing Module is the module that supports or controls the actions of every other component in the system. It also holds the current state of the traffic.

Other Modules are the components that bring all desired functionalities to the system. They can be *Action Based Modules* or *Query Based Modules*. The Action Based ones are modules that take direct actions in the traffic context. The Query Based are the type of modules that hold a traffic status of their own, based on their own input.

Objectives

O1: The first objective of this project is designing and implementing a system able to have a live overview of the Connected Cars Context. This system can be used in taking different actions related to traffic by several actors.

O2: The second one is developing a simulator module in order to generate and feed data to the system, in order to test the functionalities. This simulator will mimic genuine traffic participants actions related to traffic.

O3: Design and implement test suites which will help in the analysis of the effects of traffic participants decisions in traffic.



Results

Personal Contributions (Objectives)

	OBJECTIVE	CS	CD
O1	1.1: Study the state-of-the-art existing systems	✓	-
	1.2: Design a high-level architecture of the system in its basic form	✓	✓
	1.3: Decide what elements should be implemented / used from external sources	-	✓
	1.4: Decide on open source solutions to cover the elements that will be used	-	✓
	1.5: Setup test the open source project in order to ensure performance	-	✓
	1.6: Understand the features, capabilities and limitations the open source project	✓	-
	1.7: Decide what elements of the open source solution will be used	-	✓
	1.8: Implement the system with respect to O1.2 and O1.7	-	✓
O2	2.1: Decide what elements of the traffic will be simulated in order to test	✓	-
	2.2: Design the simulator module in order to cover all the traffic element	✓	✓
	2.3: Implement and connect the simulator module and tests the functionalities	-	✓
O3	3.1: Decide on the behaviours that are to be studied	✓	-
	3.2: Decide on a set of parameters used in order to simulate the chosen behaviours	✓	-
	3.3: Decide on a list of metrics to study the simulated context	✓	-
	3.4: Implement the research part of the simulator	-	✓
	3.5: Compute and study the results of the simulations	✓	-
	3.6: Draw relevant conclusions concerning the study	X	-

Analysis of Results (Metrics)

Number of Route Requests	15072
Average Route Request Response Time	00:00:00.120293
Maximum Route Request Response Time	00:00:02.274660
Number of Update Requests	52231
Average Update Request Response Time	00:00:00.0192022
Maximum Update Request Response Time	00:00:00.125830

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